

WHAT IS CLAIMED IS :

1. A small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display, characterized in that the said LCD backlight module emits light beams, from specified positions, limited to small angle range, and pointing to specified orientation,
including :

lower prism, comprising an emitting face, making light beams propagating in certain angles range inside LGP transmit through its emitting face of lower prism;

light guiding plate (LGP), engaged with a plurality of lower prisms into an integral unit on its emitting surface; or produced together, with a plurality of lower prisms located on its emitting surface, in an unit process;

upper prism, comprising an entering face and an total reflecting face, making light beams transmitting into its entering face be reflected totally from its total reflecting face and transmit through upper prism

plate in certain specified orientations

upper prism plate, engaged with a plurality of upper prisms into an integral unit; or produced together with a plurality of upper prisms in an unit process;

wherein light beams propagating in certain angles range inside LGP are refracted by each corresponding said lower prism and transmit through said emitting face of each said lower prism , and across an air gap; said light beams are incident on, refracted by and transmit into said entering face of corresponding upper prism; said light beams propagate inside said upper prism and onto said total reflecting face, and then said light beams are totally reflected from said total reflecting face, and further said totally reflected light beams transmit through said upper prism plate, limited to small angle range, pointing to specified orientations, being able to be looked as if those were emitted from corresponding specified positions of LGP.

2. The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to

claim 1, wherein the cross section of said lower prism is quasi-triangle.

3. The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to claim 1, wherein the cross section of said upper prism is quasi-triangle.
4. The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to claim 1, wherein said totally reflected light beams transmitting through said upper prism plate can be looked as if those were emitted from nearby of border of corresponding lower prisms of LGP.
5. The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to claim 2, wherein the cross section of said upper prism is quasi-triangle, and said totally reflected light beams transmitting through said upper prism plate can be looked as if those were emitted from nearby of border of corresponding lower prisms of LGP.
6. The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to

claim 5, wherein the length of bottom side of lower prism's quasi-triangle which contacting LGP is near the distance of openings of LCD substrate.

7. The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to claim 5, wherein said totally reflected light beams transmitting through said upper prism plate are limited to small angle range; orientations of said small angle include those pointing to openings of LCD substrate.
8. The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to claim 5, wherein said totally reflected light beams transmitting through said upper prism plate are limited to small angle range; orientations of said small angle range include those vertical to said upper prism plate.
9. The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to claim 5, wherein lines drawn from borders of lower prisms and vertical to upper prism plate pass through openings of LCD substrate.
10. The small-angled, specifically-positioned and specifically-orientated light emitting device of

backlight module of liquid crystal display according to claim 5, wherein, after the light beams transmit through said emitting face of each said lower prism and across air gap, said light beams are incident on, refracted by and transmit into said entering face of corresponding upper prism, and the angles, formed by normal of total reflecting face of upper prism and rays of said light beams propagating inside upper prism and onto total reflecting face, are equal to or greater than critical angle of upper prism material.

11. The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to claim 5, wherein, after transmitting into upper prism, light beams are totally reflected by total reflecting face of upper prism, then transmit through upper prism plate; the width of said light beams transmitting through upper prism plate is near width of said light beams when propagating inside lower prism, and directions of angle range of said light beams transmitting through upper prism plate include orientation vertical to upper prism plate.
12. The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to

claim 5, wherein range of opposite angle ω of lower prism's emitting face is:

$$0 < \omega \leq 0.5 \theta_c;$$

θ_c is critical angle of lower prism's material.

13. The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to claim 5, wherein range of angle α formed by emitting face and bottom side of lower prism is:

$$0 < \alpha \leq 90^\circ.$$

14. The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to claim 5, wherein range of vertex angle θ of upper prism's quasi-triangle, which is near LGP, is:

$$90^\circ - \theta_c \leq \theta \leq 180^\circ - \alpha - \omega;$$

θ_c is critical angle of lower prism's material; α is angle formed by emitting face and bottom side of lower prism, and ω is opposite angle of lower prism's emitting face.

15. The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to claim 5, wherein range of curvature radius of upper

prism's entering face r_1 is:

$T < r_1 \leq \infty$, and

range of curvature radius of upper prism's total reflecting face is:

$T < r_2 \leq \infty$;

said T is the shortest distance between LCD substrate and intersecting point of entering face of upper prism and total reflecting face of upper prism.

16. The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to claim 5, wherein curvature center of entering face and total reflecting face of upper prism are above the border between upper prism and upper prism plate (i.e. opposite side of vertex angle θ of upper prism's quasi-triangle, which is near LGP).
17. The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to claim 5, wherein
the length of bottom side of quasi-triangle of lower prism (i.e. border line between each lower prism and LGP)is near distance of neighboring openings of LCD substrate, and

lines, which are drawn from borders of each two neighboring lower prisms and vertical to upper prism plate, will transmit through corresponding openings of LCD substrate.

18. The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to claim 5, wherein

the angles, formed by normal of total reflecting face of upper prism and rays of said light beams propagating inside upper prism and onto total reflecting face, are equal to or greater than critical angle of upper prism material, and

the width of said light beams transmitting through upper prism plate is near width of said light beams when propagating inside lower prism, and directions of angle range of said light beams transmitting through upper prism plate include orientation vertical to upper prism plate.

19. The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to claim 5, wherein range of opposite angle ω of lower prism's emitting face is:

$$0 < \omega \leq 0.5 \theta_c, \text{ and}$$

θ_c is critical angle of lower prism's material;
range of vertex angle θ of upper prism's quasi-triangle, which is near LGP, is:

$$90^\circ - \theta_c \leq \theta \leq 180^\circ - \alpha - \omega, \text{ and}$$

θ_c is critical angle of lower prism's material; α is angle formed by emitting face and bottom side of lower prism, and ω is opposite angle of lower prism's emitting face.

20. The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to claim 19, wherein

the length of bottom side of quasi-triangle of lower prism (i.e. border line between each lower prism and LGP) is near distance of neighboring openings of LCD substrate;

lines, which are drawn from borders of each two neighboring lower prisms and vertical to upper prism plate, will transmit through corresponding openings of LCD substrate;

the width of said light beams transmitting through upper prism plate is near width of said light beams when propagating inside lower prism, and

directions of angle range of said light beams transmitting through upper prism plate include orientation vertical to upper prism plate.

21. The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to claim 20, wherein range of curvature radius of upper prism's entering face r_1 is:

$T < r_1 \leq \infty$, and

range of curvature radius of upper prism's total reflecting face is:

$T < r_2 \leq \infty$;

said T is the shortest distance between LCD reflecting layer and intersecting point of entering face of upper prism and total reflecting face of upper prism.

22. The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to claim 21, wherein curvature center of entering face and total reflecting face of upper prism are above the border between upper prism and upper prism plate (i.e. opposite side of vertex angle θ of upper prism's quasi-triangle, which is near LGP).

23. The small-angled, specifically-positioned and specifically-orientated light emitting device of

backlight module of liquid crystal display according to each individual claim from claim1, wherein a film or filling layer with similar refractive index of upper prism is applied between upper prism plate and LCD's substrate.

- 24.The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to each individual claim from claim2, wherein a film or filling layer with similar refractive index of upper prism is applied between upper prism plate and LCD's substrate.
- 25.The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to each individual claim from claim3, wherein a film or filling layer with similar refractive index of upper prism is applied between upper prism plate and LCD's substrate.
- 26.The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to each individual claim from claim4, wherein a film or filling layer with similar refractive index of upper prism

is applied between upper prism plate and LCD's substrate.

- 27.The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to each individual claim from claim5, wherein a film or filling layer with similar refractive index of upper prism is applied between upper prism plate and LCD's substrate.
- 28.The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to each individual claim from claim6, wherein a film or filling layer with similar refractive index of upper prism is applied between upper prism plate and LCD's substrate.
- 29.The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to each individual claim from claim7, wherein a film or filling layer with similar refractive index of upper prism is applied between upper prism plate and LCD's substrate.
- 30.The small-angled, specifically-positioned and specifically-orientated light emitting device of

backlight module of liquid crystal display according to each individual claim from claim8, wherein a film or filling layer with similar refractive index of upper prism is applied between upper prism plate and LCD's substrate.

- 31.The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to each individual claim from claim9, wherein a film or filling layer with similar refractive index of upper prism is applied between upper prism plate and LCD's substrate.
- 32.The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to each individual claim from claim10, wherein a film or filling layer with similar refractive index of upper prism is applied between upper prism plate and LCD's substrate.
- 33.The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to each individual claim from claim11, wherein a film or filling layer with similar refractive index of upper prism

is applied between upper prism plate and LCD's substrate.

34. The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to each individual claim from claim12, wherein a film or filling layer with similar refractive index of upper prism is applied between upper prism plate and LCD's substrate.
35. The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to each individual claim from claim13, wherein a film or filling layer with similar refractive index of upper prism is applied between upper prism plate and LCD's substrate.
36. The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to each individual claim from claim14, wherein a film or filling layer with similar refractive index of upper prism is applied between upper prism plate and LCD's substrate.
37. The small-angled, specifically-positioned and specifically-orientated light emitting device of

backlight module of liquid crystal display according to each individual claim from claim15, wherein a film or filling layer with similar refractive index of upper prism is applied between upper prism plate and LCD's substrate.

- 38.The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to each individual claim from claim16, wherein a film or filling layer with similar refractive index of upper prism is applied between upper prism plate and LCD's substrate.
- 39.The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to each individual claim from claim17, wherein a film or filling layer with similar refractive index of upper prism is applied between upper prism plate and LCD's substrate.
- 40.The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to each individual claim from claim18, wherein a film or filling layer with similar refractive index of upper prism

is applied between upper prism plate and LCD's substrate.

- 41.The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to each individual claim from claim19, wherein a film or filling layer with similar refractive index of upper prism is applied between upper prism plate and LCD's substrate.
- 42.The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to each individual claim from claim20, wherein a film or filling layer with similar refractive index of upper prism is applied between upper prism plate and LCD's substrate.
- 43.The small-angled, specifically-positioned and specifically-orientated light emitting device of backlight module of liquid crystal display according to each individual claim from claim21, wherein a film or filling layer with similar refractive index of upper prism is applied between upper prism plate and LCD's substrate.
- 44.The small-angled, specifically-positioned and specifically-orientated light emitting device of

backlight module of liquid crystal display according to each individual claim from claim22, wherein a film or filling layer with similar refractive index of upper prism is applied between upper prism plate and LCD's substrate.